

**Remarks/Arguments:**

Claims 1-3, 6, 7, and 9-12 were pending in this application. With this amendment, claims 13-36 are being added. Therefore, claims 1-3, 6, 7, and 9-36 are now the pending claims in this application.

Claims 1-3, 6, 9, and 10 stand rejected under 35 U.S.C. §102(a) as anticipated by Wheeler. Of these claims, claims 1 and 9 are the only independent claims. Dependent claims 7 and 11 stand rejected under 35 U.S.C. §103 as obvious based on Wheeler in view of Jeffrey et al. (U.S. Patent No. 5,976,827). Claim 12 stands rejected under 35 U.S.C. §103 as obvious based on Wheeler in view of Horan (U.S. Patent No. 6,149,952). For the reasons discussed below, the applicants contend that these rejections should be withdrawn.

As called for by independent claims 1 and 9, the present invention relates to sensing gaseous substances using metal complexes. Claim 1 is directed to a sensor for detecting food spoilage and recites:

a sensor composition on an internal surface of the packaging or a label retained inside packaging, which composition consisting of a metal co-ordinated complex and a resinous material, which complex, upon food spoilage or the opening or the compromise of packaging, undergoes a ligand exchange reaction to release a detectable component by the preferential binding of a gaseous substance to the metal(s) atoms of the complex.

Claim 1 further specifies that the metal is selected from the group consisting of palladium, platinum, ruthenium and iron. Independent claim 9 is directed to a method for detecting food spoilage and recites the step applying to an internal surface of the package a film of a sensor composition or inserting a label coated with a film of a sensor composition as claimed in claim 1.

As such, the rejected claims specify that the metal complex undergoes a chemical reaction in which a ligand, such as fluorexon, complexed with a metal, such as palladium, undergoes an exchange with a gaseous substance, such as sulfur compounds or nitrogen compounds present in spoiled foods. Upon such reaction, the ligand, which is a detectable component such as a fluorexon, is released. This released component is used to detect the food spoilage. This feature has advantages over current sensors and methods in that it enables the present invention to be suitable for use directly in the package, allowing

continuous monitoring of food quality from packaging to consumption. The claimed invention overcomes the disadvantages of long evaluation times and sample destruction in currently used methods.

Turning first to the anticipation rejection based on Wheeler, the applicants contend that Wheeler fails to teach at least three claimed features, namely that: (1) any of the four claimed metals are used in the sensor composition; (2) the sensor composition includes "a metal co-ordinated complex ... which complex, upon food spoilage or the opening or the compromise of packaging, undergoes a ligand exchange reaction to release a detectable component"; and (3) the reaction is with a *gaseous* substance. The applicants elaborate on these points below.

Turning first to point (1), paragraph 6 of the Office Action indicates that Wheeler discloses a sensor for sensing oxygen comprising a palladium metal fluorophore. It is clear from the context of Wheeler, however, that only a gold-containing sensor is disclosed. In the brief description of the only working sensor taught by Wheeler, the article states:

Mills set about incorporating miniscule amounts of two gold compounds into a thin plastic film. To his delight, the sensor worked.

Under the heading "Researcher finds gold," Mills says, "When you talk about gold, platinum or palladium it sounds very expensive but we use them in such small amounts - 10th or 100ths of a milligram." Thus, the Wheeler article does not mention platinum and palladium in the context of a sensor for detecting oxygen in food packaging. Clearly, therefore, current claims 1 and 9 are novel over the wheeler article.

As to point (2), the nature of the gold compounds used in the sensor is not set forth other than merely the words "two gold compounds." Therefore, Wheeler fails to disclose the claimed form of the metal complex, namely "a metal co-ordinated complex which undergoes a ligand exchange reaction by the preferential binding of a gaseous substance to the metal(s) atoms of the complex." In fact, contrary to the implication in paragraph 6 of the Office Action, Wheeler fails to disclose any ligand being emitted, let alone a ligand which is part of a metal co-ordination complex which undergoes a ligand exchange reaction with a

gaseous component to release a detectable component. This is another reason for withdrawing the rejections.

Regarding point (3) and referring again to paragraph 6 in the Office Action, it appears that the rejections using Wheeler rely on the fact that the Wheeler article teaches sensing oxygen, including oxygen dissolved in non aqueous solutions such as ethanol. Claims 1 and 9, however, require preferential binding of a gaseous substance. Wheeler fails to disclose the binding of a gaseous substance and implies, by its statement the sensor "*also* detects oxygen in *non-aqueous* solutions", that only liquids (either aqueous or non-aqueous) are contemplated. For the Examiner's reference, enclosed is an extract from the Chambers Twentieth Century Dictionary (1977), wherein "gaseous" is defined as being "in a state of gas" and wherein "gas" is defined as "a substance in a condition in which it has no definite boundaries or fixed volume, but will fill any space." Therefore, oxygen dissolved in ethanol is non-gaseous. Consequently, the Wheeler article does not disclose the feature of preferentially binding a *gaseous* substance, as recited by independent claims 1 and 9 and thus all of the rejected claims. For any of these reasons, the rejection under Section 102 should be withdrawn.

Turning to the rejections under Section 103(a) of dependent claims 7, 11, and 12, the applicants note that these rejections rely on Wheeler as satisfying all of the features discussed above as points (1), (2), and (3), all of which appear in independent claims 1 and 9. The secondary references, Jeffrey et al. (US '827) and Horan (US '952), are used in the Office Action to satisfy the limitations introduced by the dependent claims. Accordingly, the prior art rejections should be withdrawn as the references, as combined, fail to meet all of the limitations.

Claims 13 through 36 have been added, and claims 13 and 29 are the two independent claims of this set. The two independent claims recite that the metal complex is a palladium-fluorophore complex; that the complex, upon food spoilage, undergoes a ligand exchange reaction to release a detectable component; and that the reaction is with a gaseous substance. Therefore, the applicants submit that these claims are patentable over the cited reference for similar reasons as discussed above.

No new matter has been added by the submission of newly added claims 13-36. The applicants set forth exemplary citations in the application which provide support for the indicated claim or claims: Page 2, lines 20-24 (claim 14); page 2, line 26 (claim 15); page 5, lines 5 and 6 (claim 16); page 4, line 16 (claim 17); page 6, lines 3-5 (claim 18); page 3, lines 2-4 (claims 19 and 30); page 3, lines 10-12 (claims 20 and 32); page 3, lines 14 and 15 (claims 21 and 31); page 3, lines 23-26 (claims 22 and 33); page 2, lines 30 and 31 (claim 23); page 5, lines 29-31 (claim 24); page 5, lines 8 and 9 (claims 25 and 34); page 6, lines 3-5 (claim 26); page 2, lines 28-30 (claims 27 and 35); and page 5, lines 1-3, 5, and 6 (claims 28 and 36).

For the Examiner's convenience, the applicants note that claim 13 is similar to claim 6 as it stood as of the amendment filed on August 7, 2003, except that claim 13 is directed to detecting "food spoilage products within food packaging" as opposed to both food spoilage and "the opening or compromise of a package," as recited in old claim 6. The only rejection of this claim made in the Office Action of November 10, 2003, was an obviousness rejection based on Wolfbeis et al. (U.S. Patent 5,407,829) in view of Moretti et al. as evidenced by Dojindo Online. Moreover, independent claim 29 is analogous to claim 13. Therefore, in an effort to expedite prosecution, the applicants provide below reasons why claims 13 and 29 are patentable over these references, even though the applicants maintain the arguments previously advanced that are applicable to claims 13-36.

Wolfbeis et al. are directed to quality control of packaged organic substances by contacting the internal surface of a package with an optical sensor element. The sensor element changes visible color or fluorescence upon a change in the composition of the gas phase due to decay of the organic substances. The optical sensor element comprises lead (see column 4, line 37), mercury, or cadmium (see column 4, line 63). As stated in the Office Action of November 10, 2003, Wolfbeis et al. fail to teach that the sensors undergo a ligand exchange reaction. In addition, Wolfbeis et al. fail to teach the particular metal claimed in claims 13 and 29, namely palladium, let alone the claimed metal complex, namely a palladium-fluorophore complex.

Moretti et al. have been advanced to satisfy these missing limitations. Moretti et al. teach the use of a palladium-calcein complex to detect sulfur-containing organic compounds, which are thyrostatic drug residues in animal thyroids. This is accomplished by

using high-performance, thin-layer *liquid* chromatography. As can be clearly understood from the "Experimental" section of the paper, a liquid working solution is prepared (page 460, first paragraph). As described in the "Chromatography" subsection, two particular solvents are selected and are individually applied in two-dimensional liquid chromatography in order to separate a particular thyrostatic, namely 6-methyl-2-thiouracil (MTU), from other constituents in the sample. The selection of solvents is important, as Moretti et al. state at page 461, "Several solvent systems were studied to obtain the best separation of MTU from the biological matrix components present in the extracts." The presence of MTU was confirmed in part by comparing the  $R_f$  values of a sample with that of a reference MTU, which was obtained by spotting a working solution of MTU on the chromatography plates.

This more detailed explanation of Moretti et al. mandates a conclusion that it would not have been obvious to combine Moretti et al. with Wolfbeis et al. at the time of the invention. First, the applicants cannot imagine using a liquid chromatography system in a food spoilage sensor. For example, the solvents in Moretti et al. were chloroform/acetone and ethyl acetate. The applicants cannot envision how the solvent might be in contact with the sensor without having the solvent or solvent vapors undesirably contact the food. More generally, it is not contemplated that the sensor of the claimed invention be immersed in any liquid, but instead be in contact with a gaseous substance. In addition, Moretti requires including a reference MTU spot to compare with the sample, which clearly would not be desirable. There would be problems of orienting the sample relative to the food both initially and then for the second dimension, if liquid chromatography were to be employed. Finally, Moretti et al. are concerned with separating MTU from other "biological matrix components" as opposed to just detecting its presence as is done in the claimed invention.

In sum, there is simply no contemplation in Moretti et al. that its system would work in a food sensor environment, such as set forth in Wolfbeis et al. In assessing these points, the applicants note that, when considering obviousness, a prior art reference must be considered in its entirety, i.e., as a whole. See MPEP § 2141.02. With this in mind, the applicants submit that one skilled in the art would not have been motivated to combine these references and, even if so, there would have been no reasonable expectation that the combination would have worked. Thus, a *prima facie* case of obviousness has not been made.

Appln. No.: 09/763,981  
Amendment Dated November 29, 2004  
Reply to Office Action of November 10, 2003

JMYT-233US

In view of the arguments set forth above, the applicants respectfully request withdrawal of the rejections and request early notification of allowance of the pending claims.

Respectfully submitted,



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